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Chirurgisches laparoskopisches Instrument

Instrument chirurgical laparoscopique

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Description

[0001] This invention relates to a laparoscopic surgical instrument having a pair of jaws which are pivotable with respect to each other. The invention is particularly but not exclusively applicable to an electrosurgical instrument with jaws insulated from each other.

[0002] A disposable laparoscopic instrument is disclosed in EP-A-0507622. Mounted at the end of a tube for insertion into the body cavity is a pair of jaws pivotable with respect to each other about a common pivot axis in a scissor action. The jaws are actuated by a push rod in the tube, the end of the push rod being connected beyond the end of the tube by a pair of links to proximally directed extensions of the jaws so that reciprocation of the push rod causes pivoting of the jaws.

[0003] Being a laparoscopic instrument, this prior device is designed to be introduced through a so-called "keyhole" aperture or port placed in the wall of the body cavity using a trocar. For minimal tissue damage such ports are made as small as possible with typical port sizes being in the range of from 5mm to 12.5mm and, as a result, the instrument suffers from disadvantages arising out of the compact construction necessary to allow the jaws and their actuating mechanism to be passed through a narrow trocar, particularly a limitation on the force which can be applied by the jaws and distortion of the mechanism during use.

[0004] The problems faced by the designer of a laparoscopic instrument are compounded if electrosurgical energy is to be applied. In open surgical procedures, bipolar electrosurgery is most commonly used with forceps applicators. As the tissue to be treated is in close proximity to the hand of the operator, the forceps are constructed as long arms insulated and hinged at the rear.

[0005] Each arm of the forceps is connected to the active and return output lines of an the electrosurgery radio frequency (RF) generator. In this fashion, all tissue within the grasp of the forceps may be desiccated. The most useful application of bipolar forceps is in stemming blood flow from cut vessels. They are particularly useful in this application because the blood vessel may be closed by applying closure pressure to the forceps before activating the RF output. During activation, the inner walls of the vessel become tacky and therefore stick together whilst the blood within the vessel forms a coagulum. Thus blood loss from severed blood vessels may be quickly staunched.

[0006] The delivery of electrosurgical energy by a laparoscopic instrument is of particular advantage when parting or dissecting tissue. This is a difficult operation when performed remotely and hidden blood vessels are easily ruptured, which means that it is advantageous to be able to use one and the same instrument for cauterisation, i.e. using RF energy, or desiccation prior to dissection. Due to the need to be able to apply a controllable opening force for the dissection action, scissors or graspers are favoured which, by their nature, tend to be used for monopolar application of RF energy. Laparoscopic instruments for bipolar electrosurgery have to date relied upon modifying conventional designs. One known instrument makes use of two forceps arms resiliently biased apart at a point close to the working ends. Closure of the forceps is achieved by passing an outer tube over the sprung arms to urge them together. The main drawback of this design is that there is no controllable opening force other than the weak force provided by the spring. This prevents use of the device as a dissector, a fact which has to date limited the exploitation of bipolar techniques.

[0007] EP-A-0518230 discloses a bipolar laparoscopic electrosurgical instrument in which two jaws partly covered with an insulative coating are mounted on a common transverse pivot pin in a housing at the end of a tube for introduction into the body cavity. The jaws extend distally from the housing and are actuated by a control member which can be reciprocated within the instrument shaft. The reciprocating movement of the control member is converted to pivoting movement of the jaws by a non-conductive transversely mounted actuator pin at a distal end of the control member engaging slotted arms on the jaws.

[0008] In Figure 9A of US-A-5201743 there is disclosed a non-electrosurgical instrument in which a pair of jaws pivotally mounted in a housing at the end of a tube executes a scissor action by virtue of having proximal projecting guide track followers which run in inclined guide tracks formed as grooves in a cam plate on the distal end of a control member reciprocable within the tube.

[0009] According to a first aspect of this invention, a laparoscopic electrosurgical instrument comprises a tube for introduction into the body through an aperture in the body cavity wall; a housing at the end of the tube; a pair of jaws extending distally from the housing and each having an electrically conductive portion coupled to a respective electrical supply conductor at least one of which is located in the tube, at least one of the jaws being pivotally mounted on the housing to allow pivotal opening and closing movements with respect to the other jaw about a transverse pivot axis; an elongate control member extending inside the tube and reciprocable longitudinally with respect to the tube and the housing; and an actuator formed of an electrically insulative material and having a head part with a guide track, the actuator being arranged at a distal end of the control member so as to be reciprocable therewith, and such that the head part is located distally of the or each said pivot axis and between the jaws; wherein the at least one pivotally mounted jaw has a guide track follower spaced from the pivot axis and engaging the actuator guide track, the guide track being so oriented that longitudinal reciprocating movement of the actuator is converted into pivotal movement of the said at least one jaw about the pivot axis. The instrument may be a pair

of forceps with the jaws formed for grasping tissue, or it may be a cutting device with the jaws shaped as blades or as a blade and anvil combination. Preferably, both jaws are pivotally mounted on the housing, and the actuator has a pair of guide tracks, and each jaw having a respective guide track follower engaging a respective one of the guide tracks, the guide tracks being so oriented that longitudinal reciprocating movement of the actuator is converted into opposing pivotal movements of the jaws.

[0010] To convert reciprocating motion into pivotal motion the or each pivotal jaw may be connected to a head part of the actuator by means of the combination of a respective guide track angled with respect to the direction of reciprocation of the control rod and a guide track follower slidable along the track. In this way the track may extend to opposite sides of the centre line of the control rod for maximum transverse travel of the guide follower. Conveniently, the track is a groove or slot which slidably houses a follower in the form of a peg or pin. The actuator head part and connecting elements (i.e. pegs or pins) of the jaws are located in the space between the opened jaws. This yields a very good range of movement of the jaws with, as a result, lower forces in the mechanism as a whole than would be needed if all movement was to be confined within a 5mm tube, for example. In particular, by having the actuator part which bears the guide track or tracks movable in a region between, on the one hand, the jaw mounting pivots and, on the other hand, the ends of the jaws, a more robust jaw structure and jaw mounting can be obtained for a given size compared with, e.g., scissor-action jaws in which the jaws are driven from an actuator located proximally of the pivots. The lateral extent and the angle of the guide track respectively determine the range of movement of the jaw and the mechanical advantage of the mechanism. While the preferred embodiments have a straight guide track, it may be curved to alter the mechanical advantage for different jaw positions, e.g. allowing closure pressure on a ruptured vessel to be increased without suffering a decrease in the range of movement. The mechanism allows a reciprocating action to be used to apply both opening and closing forces from the handgrip. In embodiments in which both jaws are pivotable, the actuator is a longitudinally reciprocable element with one guide track inclined in one angled orientation relative to the direction of movement, and another guide track inclined in a different or oppositely angled orientation so that as the actuator is moved the peg or pin of one jaw moves in opposite direction to the peg or pin of the other jaw. The tracks are preferably formed on opposite faces or sides of the actuator.

[0011] Each jaw may be formed from a metallic material and connected to supply conductors associated with the tube, with the housing being formed of an electrically insulating material such as plastics. In the case of both jaws being pivotable, the pivots on the housing may be spaced apart as a means of maintaining electrical isolation between the jaws. The use of plastics in the mechanism is made possible due to the relatively low forces permitted by the design of mechanism, allowing the jaws to be insulated in an inexpensive and simple manner.

[0012] Bipolar electrosurgical cutters may be similarly constructed bringing the same advantages of electrical isolation and the ability positively to drive the jaws not only together but also apart.

[0013] According to a second aspect of the invention, there is provided a laparoscopic surgical instrument comprising: a tube for introduction into the body through an aperture in the body cavity wall, a housing at the end of the tube, a pair of jaws extending distally from the housing, at least one of the jaws being pivotally mounted on the housing to allow opening and closing movements with respect to the other jaw, a control member reciprocable in the tube, and an actuator at the end of the control member, which actuator has an actuator head part located between the jaws and distally of the pivotal mounting of the at least one pivotally mounted jaw on the housing, the head part having a guide track cooperating with a guide track follower on the jaw to convert reciprocating movement of the control member into a pivoting movement of the jaw.

[0014] The invention will now be described by way of example with reference to the drawings in which:-

Figure 1 is a plan view of laparoscopic forceps in accordance with the invention, shown with open jaws;

Figures 2 is a partly longitudinally sectioned plan view corresponding to Figure 1;

Figure 3 is a plan view of the forceps with the jaws closed;

Figure 4 is a side view of the forceps;

Figure 5 is a plan view of one of the jaws of the forceps;

Figure 6 is an outer side view of the jaw;

Figure 7 is a cross-section of the jaw along the line VII-VII in Figure 6;

Figure 8 is a perspective view of one half of a jaws housing;

Figure 9 is a perspective view of an actuator of the forceps;

Figure 10 is a cross-section on the line IX-IX in Figure 3;

Figure 11 is a cross-section on the line X-X in Figure 3; and

Figure 12 is a cross-section on the line XI-XI in Figure 3.

[0015] A preferred embodiment of the invention now to be described is a pair of laparoscopic forceps capable of being used for bipolar electrosurgery. The instrument has a pair of hinged forceps jaws mounted at the end of a shaft in the form of a tube which passes through a trocar fitted in the wall of the body cavity, and at the outer end of the tube there is a hand grip connected to an RF generator. The shaft is typically 280 to 360 mm in length. It is to be understood that this description and the accompanying drawings relate to that part of the instrument which is used inside the body cavity. It is also to be understood that the forceps jaws may instead be the blades of a cutter, or they may constitute a blade and an anvil in an alternative cutter.

[0016] Referring to Figures 1 to 4 of the drawings, the instrument shaft, in the form of a stainless steel tube 10, has mounted at its end a pair of steel forceps jaws 12A, 12B. Each jaw is independently pivoted at its proximal end on a jaw housing comprising two plastics collet halves 14A, 14B fitted in the end portion of the tube 10, and is pivotable between open and closed positions by a plastics actuator 16 having an actuator head part 16H located between the jaws 12A, 12B distally of their pivots, and an actuator shaft 16S passing between the collet halves 14A, 14B and connected to a control rod 18 of approximately 1mm in diameter which runs the length of the tube 10 for connection to the hand grip (not shown). In Figures 1 and 2 the jaws are shown in their open position. In Figure 3 they are shown in their closed position.

[0017] Also located in the tube 10 are two electrical supply conductors 20A, 20B which, although shown only in part in Figure 2, extend the length of the tube 10. They are free to twist in the main part of the tube 10 to allow for rotation of the forceps with respect to the hand grip. Each conductor comprises a stainless steel strip having heatshrink insulation where it passes through the tube 10. Grooves 14G are provided in each of the collet halves 14A, 14B for receiving the conductors which pass distally out of the collet into recesses of the jaws 12A, 12B where they are welded to the material of the jaws. Details of the jaws 12A, 12B are seen more clearly in Figures 5, 6, and 7.

[0018] Referring to Figures 5, 6, and 7, each jaw 12A, 12B is a single metal injection moulding of stainless steel 304, coated with an insulating compound such as PTFE on substantially all surfaces except the grasping face 12G and the electrical connection area of an inwardly facing recess 12R which opens into an outer recess of the jaw 12A as shown in Figures 6 and 7. The coating prevents accidental cautery of tissue adjacent the operation site. Each jaw comprises a distally tapered body which has, at its proximal end two projecting hinge pins 12P each of which defines a common off-centre hinge axis perpendicular to the longitudinal axis of the instrument and is received in a corresponding bore 14PB in one of the collet halves 14A, 14B (see Figure 1). The collet halves are so formed that the hinge pins 12P of the jaws 12A, 12B are mounted immediately adjacent the end of the tube 10 for rigidity. Intermediate its ends, each jaw has an inwardly extending ear 12E which is spaced from the longitudinal axis and has an inwardly directed actuation peg 12F for engaging a guide groove in the actuator 16, as will be described below. With regard to their external shape, the jaws are shaped and dimensioned to fit within the circular envelope 24, shown in Figure 7, corresponding to the outer profile of the tube 10 when the jaws are closed, so that the complete instrument can be passed through a trocar having a corresponding internal diameter. The grasping surfaces 12G are planar and the jaws are mounted so that these surfaces meet in face-to-face contact.

[0019] Referring to Figure 8 in conjunction with Figure 1, the collet 14A, 14B has three main functions which are to mount the jaws 12A, 12B pivotally in an electrically insulating manner, to house the actuator 16 in a slidable fashion, and to house the electrical conductors 20A, 20B. The two collet halves 14A, 14B are identical, and one of them is shown in Figure 8. Each half has a part-cylindrical body having an external diameter corresponding to the internal diameter of the tube 10. It mates with the other collet half by planar surface-to-surface contact along a diameter, longitudinal interlocking being provided by corresponding projections and recesses 14P, 14R. A central internal channel 14C slidably houses the shaft 16S of the actuator 16 and the narrow grooves 14G house the conductors 20A, 20B. At the distal end, the collet half is of increased diameter, having a shoulder which abuts the end of the tube 10 and provides a pivot housing of segment-shaped cross-section penetrated by two bores 14PB for housing one pivot pin 12P of each of the jaws 12A, 12B. It will be noticed that the axes of the bores 14PB are off-centre on opposite sides of the centre line of the instrument, thereby spacing the jaws apart for electrical insulation.

[0020] The actuator 16 is shown more clearly in Figure 9 from which it will be seen that the actuator head part 16H is of rectangular cross-section and has in one of its faces a guide track in the form of a guide groove 16GG which is inclined with respect to the longitudinal axis of the instrument and which extends on both sides of that axis. A similar, but oppositely inclined groove is formed in the oppositely directed face of the head part 16H, as shown by dotted lines in Figures 1 and 2. Each groove receives a respective guide peg 12F of one of the jaws 12A, 12B. At the other end of the shaft 16S is a connector 16C for receiving the control rod 18 (see Figures 2 and 3) whereby the actuator 16 can be reciprocated to cause the jaws 12A, 12B positively to open and close. The pushing and pulling forces on the control rod 18 are

converted into lateral forces on the pegs 12F of the jaws, i.e. corresponding jaw closing and opening forces. One optional feature shown in Figure 9 is the provision of an irrigation groove 16G in the shaft 16S of the actuator 16 so that irrigation fluid pumped into tube 10 can be introduced for cleaning the forceps and for washing the operative site.

[0021] Figures 10, 11 and 12 of the drawings are included to aid understanding of the configurations of the components of the instrument. It will be seen particularly from Figure 12 which shows the forceps with the jaws in the closed configuration, that the actuator 16 substantially completely fills the gap between the two jaws 12A, 12B when the latter are in the closed configuration. Indeed, the jaws, when closed, provide an approximately rectangular-section cavity matching the external dimensions and shape of the actuator head part 16H so that the internal surfaces of the jaws which are perpendicular to the pivot axes defined by the pins 12P slide on the oppositely directed upper and lower faces of the actuator head part 16H to prevent the torsional closure forces arising by virtue of the offset location of the guide pegs 12F from causing the two jaws from twisting and thereby causing a mismatch at the distal ends of the jaws when they are closed. The effects of torsional forces are also restricted by the wide spacing of the hinge pins 12P of each jaw on either side of the longitudinal axis, and the corresponding spacing of the inwardly directed faces and bores 14PB of the collet halves 14A, 14B. Another property of the interfitting arrangement of the jaws and the actuator head part 16H is that when the instrument is first inserted into the body cavity, the likelihood of tissue being trapped is much reduced.

[0022] The instrument may be used with a generator having a variable output impedance and frequency, such as that disclosed in British Patent Specification No. 2214430 which is operable typically at voltages in the region of 150 volts.

Claims

1. A laparoscopic electrosurgical instrument comprising:

   a tube (10) for introduction into the body through an aperture in the body cavity wall;
   a housing (14A, 14B) at the end of the tube;
   a pair of jaws (12A, 12B) extending distally from the housing and each having an electrically conductive portion coupled to a respective electrical supply conductor at least one of which is located in the tube, at least one of the jaws being pivotally mounted on the housing to allow pivotal opening and closing movements with respect to the other jaw about a transverse pivot axis;
   an elongate control member (18) extending inside the tube (10) and reciprocable longitudinally with respect to the tube and the housing; and
   an actuator (16) formed of an electrically insulative material and having a head part (16H) with a guide track (16GG), the actuator being arranged at a distal end of the control member (18) so as to be reciprocable therewith and such that the head part (16H) is located distally of the or each said pivot axis and between the jaws (12A, 12B);
   wherein the at least one pivotally mounted jaw (12A, 12B) has a guide track follower (12F) spaced from the pivot axis and engaging the actuator guide track (16GG), the guide track (16GG) being so oriented that longitudinal reciprocating movement of the actuator (16) is converted into pivotal movement of the said at least one jaw (12A, 12B) about the pivot axis.

2. An instrument according to claim 1, characterised in that both jaws (12A, 12B) are pivotally mounted on the housing (14A, 14B), the actuator head part (16H) has a pair of guide tracks (16GG), and each jaw has a respective guide track follower (12F) engaging a respective one of the guide tracks, the guide tracks being so oriented that longitudinal reciprocating movement of the actuator (16) is converted into opposing pivotal movements of the jaws.

3. An instrument according to claim 2, characterised in that the jaws (12A, 12B) are pivotable on the housing (14A, 14B) about respective spaced apart transverse pivot axes.

4. An instrument according to claim 3, characterised in that the housing (14A, 14B) is made of an insulative material.

5. An instrument according to any preceding claim, characterised in that the jaws are forceps jaws (12A, 12B).

6. An instrument according to any of claims 1 to 4, characterised in that the jaws are the blades of a cutter.

7. An instrument according to any of claims 1 to 4, characterised in that the jaws comprise a cutter blade and a cutter anvil.

8. An instrument according to any preceding claim, characterised in that the or each guide track (16GG) extends both longitudinally and laterally.

9. An instrument according to claim 8, characterised in that the or each guide track (16GG) is a slot or groove.

10. An instrument according to claim 8 or claim 9, characterised in that the actuator head part (16H) is outside the confines of the tube (10).

11. A laparoscopic surgical instrument comprising:

    a tube (10) for introduction into the body through an aperture in the body cavity wall,
    a housing (14A, 14B) at the end of the tube (10),
    a pair of jaws (12A, 12B) extending distally from the housing (14A, 14B), at least one of the jaws (12A, 12B) being pivotally mounted on the housing to allow opening and closing movements with respect to the other jaw (12A, 12B),
    a control member (18) reciprocable in the tube (10), and
    an actuator (16) at the end of the control member, which actuator has an actuator head part (16H) located between the jaws (12A, 12B) and distally of the pivotal mounting of the at least one pivotally mounted jaw on the housing, the head part (16H) having a guide track cooperating with a guide track follower on the jaw to convert reciprocating movement of the control member (18) into a pivoting movement of the jaw.

12. An instrument according to claim 11, characterised in that each jaw (12A, 12B) has an electrically conductive portion coupled to a respective electrical supply conductor (20A, 20B) at least one of which is located in the tube (10), and in that at least the head part 16H of the actuator (16) is formed of an electrically insulative material.

13. An instrument according to claim 12, characterised in that the housing (14A, 14B) is made of an insulative material.

14. An instrument according to any of claims 11 to 13, characterised in that both jaws (12A, 12B) are pivotally mounted on the housing (14A, 14B), the actuator head part has a pair of guide tracks (16GG), and each jaw (12A, 12B) has a respective guide track follower (12F) engaging a respective one of the guide tracks (16GG), the guide tracks (16GG) being so oriented that longitudinal reciprocating movement of the actuator (16) is converted into opposing pivotal movements of the jaws (12A, 12B).

15. An instrument according to claim 14, characterised in that the jaws (12A, 12B) are pivotable on the housing (14A, 14B) about respective spaced apart transverse pivot axes.

Patentansprüche

1. Elektrochirurgisches laparoskopisches Instrument, das folgendes umfaßt:

    eine Röhre (10) zur Einführung in den Körper durch eine Öffnung in der Körperhöhlenwand;
    ein Gehäuse (14A, 14B) am Röhrenende;
    ein Paar sich distal von dem Gehäuse weg erstreckende Backen (12A, 12B), die jeweils einen elektrisch leitenden Teil aufweisen, der mit einem jeweiligen Stromversorgungsleiter verbunden ist, von denen sich mindestens einer in der Röhre befindet, wobei mindestens eine der Backen schwenkbar so am Gehäuse angebracht ist, daß sie Schwenköffnungs- und -schließbewegungen bezüglich der anderen Backe um eine in Querrichtung verlaufende Schwenkachse ausführen kann;
    ein längliches Steuerglied (18), das sich innerhalb der Röhre (10) erstreckt und sich in Längsrichtung bezüglich der Röhre und des Gehäuses hin und her bewegen kann; und
    ein Betätigungsglied (16), das aus einem elektrisch isolierenden Material hergestellt ist und einen Kopfteil (16H) mit einer Führungsbahn (16GG) aufweist, wobei das Betätigungsglied so an einem distalen Ende des Steuerglieds (18) angeordnet ist, daß es sich damit hin und her bewegen kann und derart, daß sich der Kopfteil (16H) distal der oder jeder Schwenkachse und zwischen den Backen (12A, 12B) befindet;
    wobei die mindestens eine schwenkbar angebrachte Backe (12A, 12B) ein von der Schwenkachse beabstandetes Führungsbahntastmittel (12F) aufweist, das an der Führungsbahn (16GG) des Betätigungsglieds angreift, wobei die Führungsbahn (16GG) so ausgerichtet ist, daß eine Hin- und Herbewegung des Betätigungsglieds (16) in Längsrichtung in eine Schwenkbewegung der mindestens einen Backe (12a, 12B) um die Schwenkachse herum umgewandelt wird.

2. Instrument nach Anspruch 1, dadurch gekennzeichnet, daß beide Backen (12A, 12B) schwenkbar am Gehäuse (14A, 14B) angebracht sind, wobei der Kopfteil (16H) des Betätigungsglieds ein Paar Führungsbahnen (16GG) aufweist, und daß jede Backe ein jeweiliges Führungsbahntastmittel (12F) hat, das an einer der jeweiligen Führungsbahnen angreift, wobei die Führungsbahnen so ausgerichtet sind, daß eine Hin- und Herbewegung des Betätigungsglieds (16) in Längsrichtung in entgegengesetzte Schwenkbewegungen der Backen umgewandelt wird.

3. Instrument nach Anspruch 2, dadurch gekennzeichnet, daß die Backen (12A, 12B) am Gehäuse (14A, 14B) um jeweilige voneinander beabstandete, in Querrichtung verlaufende Schwenkachsen schwenkbar sind.

4. Instrument nach Anspruch 3, dadurch gekennzeichnet, daß das Gehäuse (14A, 14B) aus einem isolierenden Material hergestellt ist.

5. Instrument nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es sich bei den Backen um Zangenbacken (12A, 12B) handelt.

6. Instrument nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß es sich bei den Bakken um die Messer einer Schneidvorrichtung handelt.

7. Instrument nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Backen ein Schneidmesser und einen Schneidamboß umfassen.

8. Instrument nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sich die oder jede Führungsbahn (16GG) sowohl in Längs- als auch in Querrichtung erstreckt.

9. Instrument nach Anspruch 8, dadurch gekennzeichnet, daß es sich bei der oder jeder Führungsbahn (16GG) um einen Schlitz oder eine Nut handelt.

10. Instrument nach Anspruch 8 oder 9, dadurch gekennzeichnet, daß sich der Kopfteil (16H) des Betätigungsglieds außerhalb der Grenzen der Röhre (10) befindet.

11. Chirurgisches laparoskopisches Instrument, das folgendes umfaßt:

eine Röhre (10) zur Einführung in den Körper durch eine Öffnung in der Körperhöhlenwand;
ein Gehäuse (14A, 14B) am Röhrenende;
ein Paar sich distal von dem Gehäuse (14A, 14B) erstreckende Backen (12A, 12B), wobei mindestens eine der Backen (12A, 12B) schwenkbar so am Gehäuse angebracht ist, daß sie Öffnungs- und Schließbewegungen bezuglich der anderen Backe (12A, 12B) ausführen kann;
ein Steuerglied (18), das sich in der Röhre (10) hin und her bewegen kann; und
ein Betätigungsglied (16) am Ende des Steuerglieds, das einen Betätigungsgliedkopfteil (16H) aufweist, der sich zwischen den Backen (12A, 12B) und distal der Schwenkbefestigung der mindestens einen schwenkbar angebrachten Backe am Gehäuse befindet, wobei der Kopfteil (16H) eine Fühungsbahn aufweist, die mit einem Führungsbahntastmittel an der Backe zusammenwirkt, um eine Hin- und Herbewegung des Steuerglieds (18) in eine Schwenkbewegung der Backe umzuwandeln.

12. Instrument nach Anspruch 11, dadurch gekennzeichnet, daß jede Backe (12A, 12B) einen elektrisch leitenden Teil aufweist, der mit einem jeweiligen Stromversorgungsleiter (20A, 20B) verbunden ist, von denen sich mindestens einer in der Röhre (10) befindet, und daß mindestens der Kopfteil (16H) des Betätigungsglieds (16) aus einem elektrisch isolierenden Material besteht.

13. Instrument nach Anspruch 12, dadurch gekennzeichnet, daß das Gehäuse (14A, 14B) aus einem isolierenden Material hergestellt ist.

14. Instrument nach einem der Ansprüche 11 bis 13, dadurch gekennzeichnet, daß beide Backen (12A, 12B) schwenkbar an dem Gehäuse (14A, 14B) angebracht sind, der Betätigungsgliedkopfteil ein Paar von Führungsbahnen (16GG) aufweist undjede Backe (12A, 12B) ein jeweiliges Führungsbahntastmittel (12F) aufweist, das an einer der jeweiligen Führungsbaunen (16GG) angreift, wobei die Führungsbahnen (16 GG) so ausgerichtet sind, daß eine Hin- und Herbewegung des Betätigungsglieds (16) in Längsrichtung in entgegengesetzte Schwenkbewegungen der Backen (12A, 12B) umgewandelt wird.

15. Instrument nach Anspruch 14, dadurch gekennzeichnet, daß die Backen (12A, 12B) am Gehäuse (14A, 14B) um jeweilige voneinander beabstandete, in Querrichtung verlaufende Schwenkachsen schwenkbar sind.

Revendications

1. Instrument électrochirurgical laparoscopique comprenant :

un tube (10) pour introduction dans le corps à travers une ouverture de la paroi d'une cavité du corps ;
un boîtier (14A,14B) à l'extrémité du tube ;
une paire de mâchoires (12A,12B) s'étendant distalement à partir du boîtier et ayant chacune une partie électriquement conductrice connectée à un conducteur d'alimentation électrique respectif dont au moins un est placé dans le tube, au moins une des mâchoires étant montée de façon pivotante sur le boîtier pour per-

mettre des mouvements pivotants d'ouverture et de fermeture par rapport à l'autre mâchoire autour d'un axe de pivot transversal ;

un élément de commande allongé (18) s'étendant à l'intérieur du tube (10) et déplaçable longitudinalement en va-et-vient par rapport au tube et au boîtier ; et

un actionneur (16) formé d'une matière électriquement isolante et comprenant une tête (16H) avec un chemin de guidage (16GG), l'actionneur étant disposé à une extrémité distale de l'élément de commande (18) de façon à être déplaçable en va-et-vient avec celui-ci et de sorte que la tête (16H) est située dans la direction distale par rapport à l'axe ou à chaque dit axe de pivot et entre les mâchoires (12A,12B) ; dans lequel ladite au moins une mâchoire montée de façon pivotante (12A,12B) comporte un palpeur de chemin de guidage (12F) espacé de l'axe de pivot et en prise avec le chemin de guidage (16GG) de l'actionneur, le chemin de guidage (16GG) étant orienté de sorte que le mouvement de va-et-vient longitudinal de l'actionneur (16) est converti en un mouvement pivotant de ladite au moins une mâchoire (12A,12B) autour de l'axe de pivot.

2. Instrument selon la revendication 1, caractérisé en ce que les deux mâchoires (12A,12B) sont montées de façon pivotante sur le boîtier (14A,14B), la tête (16H) de l'actionneur comporte deux chemins de guidage (16GG) et chaque mâchoire comporte un palpeur de chemin de guidage respectif (12F)en prise avec un chemin respectif des chemins de guidage, les chemins de guidage étant orientés de sorte que le mouvement de va-et-vient longitudinal de l'actionneur (16) est converti en mouvements pivotants opposés des mâchoires.

3. Instrument selon la revendication 2, caractérisé en ce que les mâchoires(12A,12B) peuvent pivoter sur le boîtier (14A,14B) autour d'axes de pivots transversaux respectifs mutuellement espaces.

4. Instrument selon la revendication 3, caractérisé en ce que le boîtier (14A,14B) est fabriqué en une matière isolante.

5. Instrument selon une quelconque des revendications précédentes, caractérisé en ce que les mâchoires sont des mâchoires de forceps (12A,12B).

6. Instrument selon une quelconque des revendications 1 à 4, caractérisé en ce que les mâchoires sont les lames d'un outil de coupe.

7. Instrument selon une quelconque des revendications 1 à 4, caractérisé en ce que les mâchoires comprennent une lame de coupe et une enclume de coupe.

8. Instrument selon une quelconque des revendications précédentes, caractérisé en ce que le ou chaque chemin de guidage (16GG) s'étend à la fois longitudinalement et latéralement.

9. Instrument selon la revendication 8, caractérisé en ce que le ou chaque chemin de guidage (16GG) est une rainure ou une gorge.

10. Instrument selon la revendication 8 ou la revendication 9, caractérisé en ce que la tête d'actionneur (16H) est en dehors des limites du tube (10).

11. Instrument chirurgical laparoscopique comprenant :

un tube (10) pour introduction dans le corps à travers une ouverture de la paroi d'une cavité du corps,

un boîtier (14A,14B) à l'extrémité du tube (10),

une paire de mâchoires (12A,12B) s'étendant distalement à partir du boîtier (14A,14B), au moins une des mâchoires (12A,12B) étant montée de façon pivotante sur le boîtier pour permettre des mouvements d'ouverture et de fermeture par rapport à l'autre mâchoire (12A,12B),

un élément de commande (18) déplaçable en va-et-vient dans le tube (10), et

un actionneur (16) à l'extrémité de l'élément de commande, ledit actionneur comportant une tête d'actionneur (16H) située entre les mâchoires (12A,12B) et distalement par rapport au montage pivotant de ladite au moins une mâchoire montée de façon pivotante sur le boîtier, la tête (16H) comportant un chemin de guidage qui coopère avec un palpeur de chemin de guidage sur la mâchoire pour convertir un mouvement de va-et-vient de l'élément de commande (18) en un mouvement pivotant de la mâchoire.

12. Instrument selon la revendication 11, caractérisé en ce que chaque mâchoire (12A,12B) comprend une partie électriquement conductrice couplée à un conducteur d'alimentation électrique respectif (20A,20B) dont au moins un est placé dans le tube (10) et en ce qu'au moins la tête (16H) de l'actionneur (16) est constituée d'une matière électriquement isolante.

13. Instrument selon la revendication 12, caractérisé en ce que le boîtier (14A,14B) est fabriqué en une matière isolante.

14. Instrument selon une quelconque des revendications 11 à 13, caractérisé en ce que les deux mâchoires (12A,12B) sont montées de façon pivotante sur le boîtier (14A,14B), la tête d'actionneur comporte deux chemins de guidage (16GG), et chaque mâchoire (12A,12B) comporte un palpeur de chemin de guidage respectif (12F) en prise avec un chemin respectif des chemins de guidage (16GG), les chemins de guidage (16GG) étant orientés de sorte qu'un mouvement de va-et-vient longitudinal de l'actionneur (16) est converti en mouvements pivotants opposés des mâchoires (12A,12B).

15. Instrument selon la revendication 14, caractérisé en ce que les mâchoires (12A,12B) peuvent pivoter sur le boîtier (14A,14B) autour d'axes de pivot transversaux respectifs mutuellement espacés.

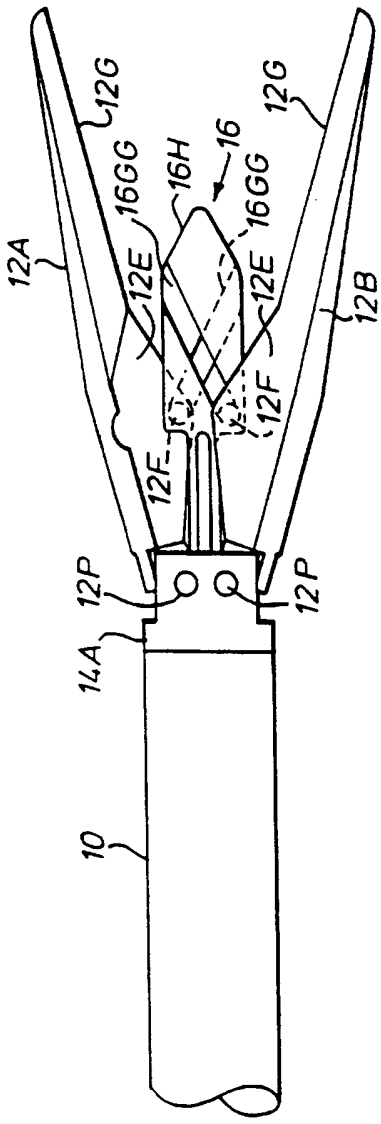
12A
12G
16GG
16H
16
16GG
12G
12E
12E
12B
12F
12F
12P
12P
14A
10

FIG.1.

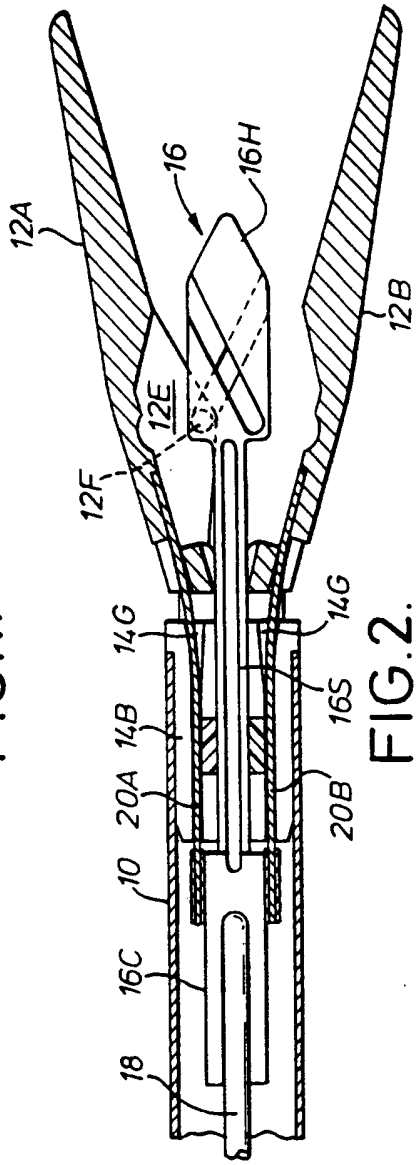
12A
16
16H
12B
12E
12F
14G
14G
16S
14B
20A
20B
10
16C
18

FIG.2.

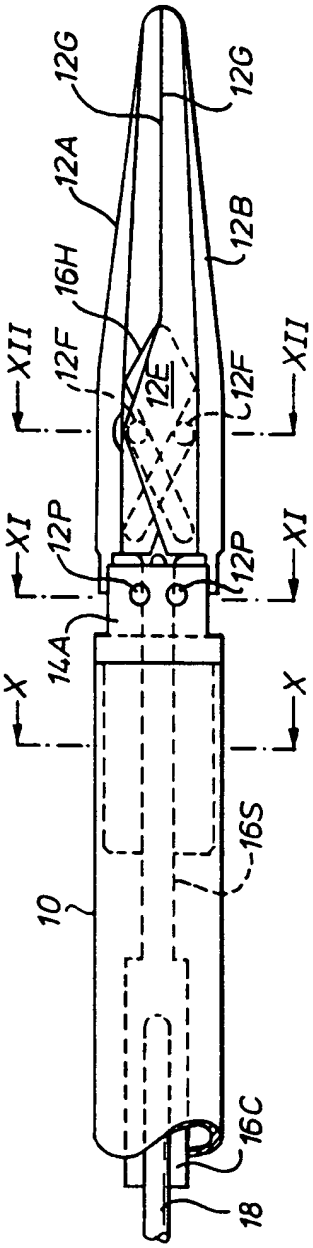
12G
12G
12A
12B
16H
XII
12F
12E
12F
XII
XI
12P
12P
XI
14A
X
X
16S
10
16C
18

FIG.3.

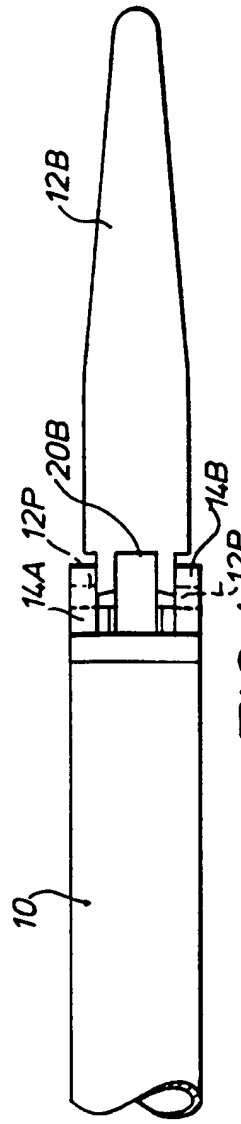
12B
20B
14B
14A
12P
12P
10

FIG.4.

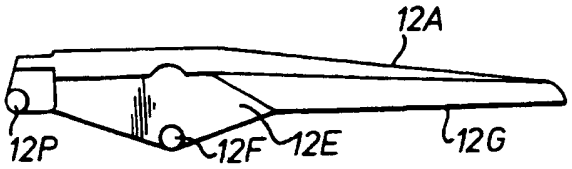

FIG.5.

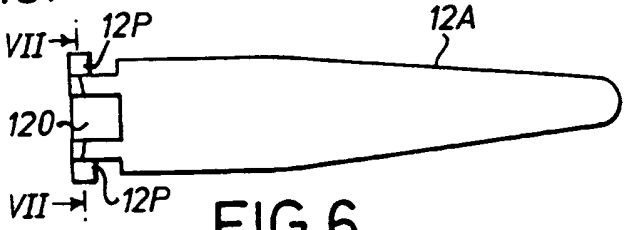

FIG.6.

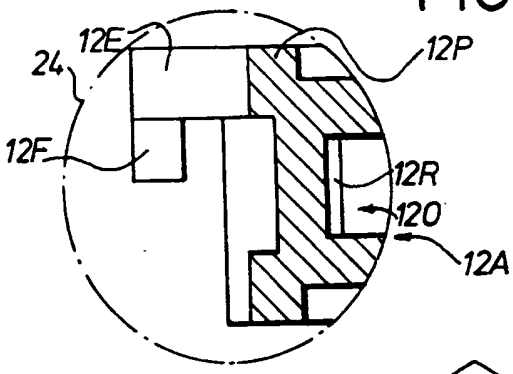

FIG.7.

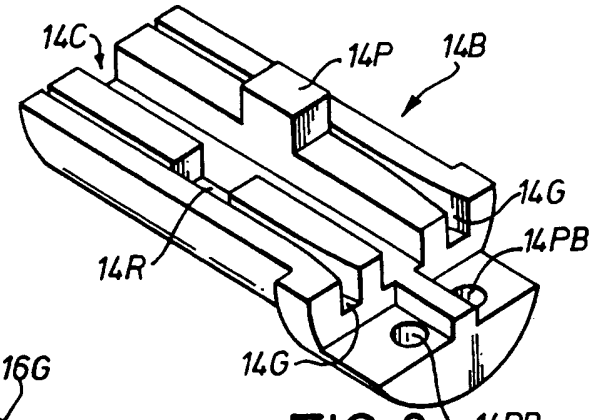

FIG.8.

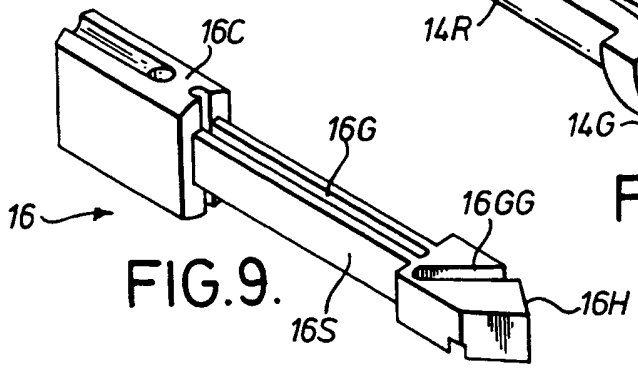

FIG.9.

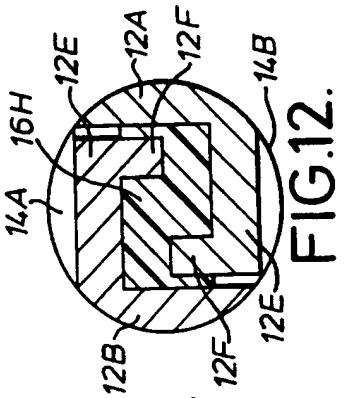

FIG.12.

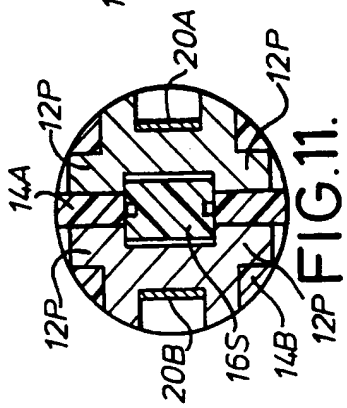

FIG.11.

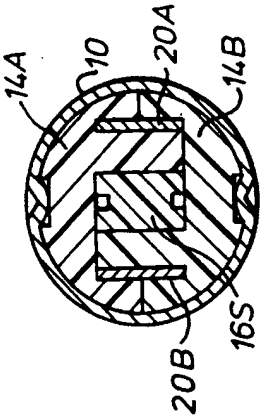

FIG.10.